Engineering Sciences International Research Journal
ISSN (Print) : 2330 – 4338 ; Volume 1 Issue 1 ǁ February. 2013 ǁ

# Cellphone Based Patient Monitoring System

**Ranjani R**

***Abstract:*** Flexible and Powerful mobile healthcare requires efficient integration of wearable devices, mobile device, communication network, database management systems etc. This paper describes a telemedicine system which brings together the patient, doctor, hospital and the pathology laboratories and hence achieves holistic patient care. The application described here will be developed to run on an Android Smartphone with an additional patient kit.

***Keywords:*** Telemedicine, SmartPhone, Chronic Disease Management

## 1. INTRODUCTION

All chronic diseases require constant monitoring and check-ups. Through proper care, patients can control the disease and prevent complications. According to patient's personal need, a proper healthcare plan requires different fields of professionals together to make up the plan. So if it is done manually, it would restrict to the experience and knowledge of these professionals, and consume lots of expensive medical resources as well. [1]. Since, a majority of the patients are either located rurally or hard pressed for time, regular visits to the doctor are troublesome and highly inconvenient. It thus makes sense to use modern day communication technologies to facilitate home monitoring of patients. Various kinds of interactive online communication systems have been introduced for chronic disease management, and their importance in managing patients is increasing. [3].

Mobile healthcare is not a new concept, but the method devised here uses widespread cellular phones and free to market Android OS. This can bring healthcare to rural areas and make it easily reachable for the urban masses at an affordable cost. The application described in this paper has been developed on Android, which provides us an ideal platform to develop a mobile based application to enable our system.

## 2. SYSTEM OVERVIEW

The system involves the patient's cell phone, a server at the hospital, the pool of registered doctors, pathology labs for tests and the interface between them. The suffering patient logs on to the system with his unique username and password, fill up his symptoms and ailments and submit it on the server. The server will then select a pool of doctors from the database based on their specialty and preferences. A notification is sent to these doctors containing a brief overview of the case, and if a doctor accepts it, the full details are sent to him. The doctor then may communicate with the the tests and the prescription will be sent to the patient on his id for future reference. Each registered patient will also have his history of treatments stored automatically; hence for regular users the doctors can have the complete case details available. There will also be a time limit for doctors to respond otherwise the case will be assigned to another doctor, and similarly for pathology labs and medical stores hence ensuring prompt service. This will also be monitored by the server. Fig. 1 illustrates the concept.

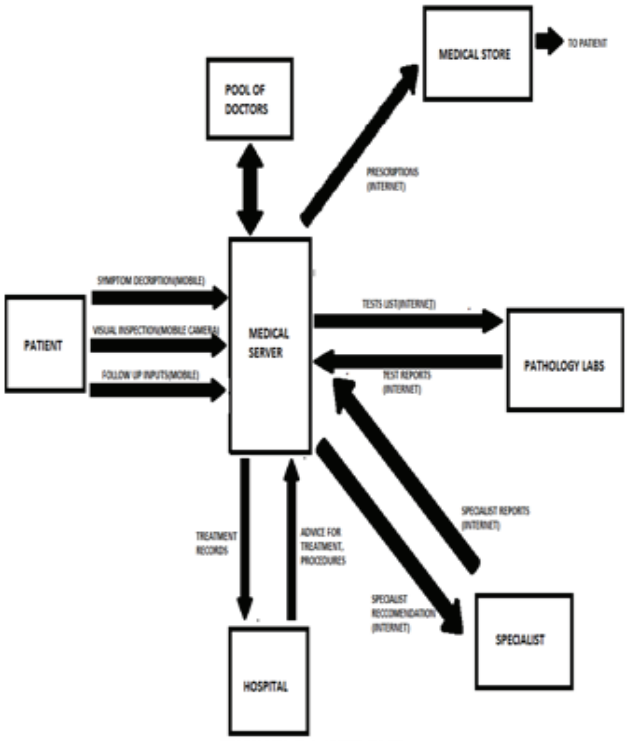


**Fig. 1. Block Diagram of Telemedicine**

## 3. SYSTEM ARCHITECTURE

The System consists of a doctor's module, patient's module and pathology laboratory's module.

### *A. Patient's Module*

The patient module consists of a health kit, Bluetooth module and application that runs on an Android Smartphone as shown in Fig. 2. The health kit comprises a digital thermometer, a digital glucometer and a digital sphygmomanometer.

#### *1) Patient Kit*

The various measurement units are integrated into a single device with a Bluetooth output.

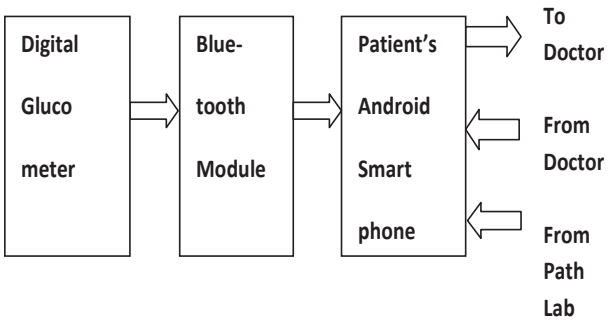


**Fig. 2. Patient's Module**

#### *2) Bluetooth Module*

Bluetooth is a specification for a small form-factor, low cost radio solution providing links between mobile computers, mobile phones and other handheld devices, and connectivity to the Internet. We will use this protocol to communicate between the patient kit and the phone through a microcontroller based embedded system.

#### *3) Android based Smartphone Application*

The application on the patient's phone registers the patient and collects medical history on the first use and on subsequent calls it directs the patient to current status form. The blood sugar values, pressure values and temperature are automatically measured and filled by the application and the sent to the server for storage in the form of an email. The application also receives prescriptions and diet suggestions from the doctor and pathology laboratory appointment alerts from the pathologist.

### *B. Doctor's Module*

The doctor logs in to the server using his MCIR number. The server then provides the list of available cases. The doctor selects a case depending on his/her specialty. After selecting the case and studying the medical history, the doctor prescribes a suitable diagnosis to the patient. The doctor also informs the patient whether one to one meeting is required or not. The doctor can also discuss the case on public forums and

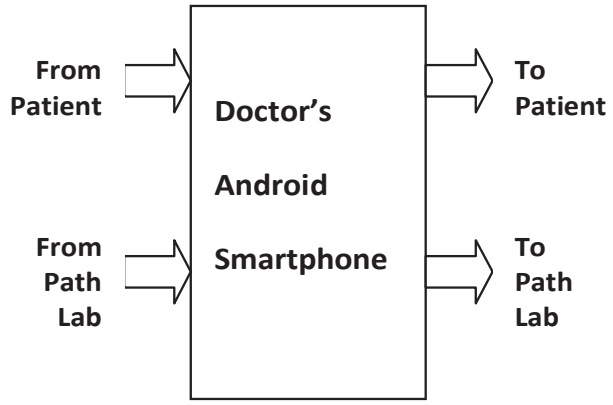


**Fig. 4. Doctor's Module**

they can recommend the case to other doctors. If further tests are to be conducted the case history is forwarded to the pathology labs. The doctor selects the lab from the list of registered labs on the basis of the labs speciality. The tests required are performed and the results are sent back to the doctor. The path labs results are stored in the server for future references. The module is shown in Fig. 4.

### *C. Pathology Lab Module*

A doctor may find the need of carrying out some more complex tests, for which we have a database of registered pathology labs. New labs shall have to fill out a registration form based on which they will be added to the database. The server assigns a pathology lab to the concerned patient based on proximity and the specialty of that lab or the patient may pick a laboratory of his choice. The list of the tests to be carried out is sent to the lab along with the patient's details. After this, the samples are obtained either by post or are physically given by the patient. The tests results are filled in a standardized format which is then sent to the doctor who acts on the basis of the results. We may use computers in the pathology lab instead of cell phones. The lab will have a deadline failing which they shall be penalized. Our application will enable the laboratory computer to log-on to the server, obtain details and post results back. They may also contact the concerned patient to allot them time slots or ask them to courier the required samples.

## 4. CONCLUSIONS

This paper has introduced a concept to monitor chronic diseases like Diabetes Mellitus using an Android based application. Using this application, patients can get quality healthcare & monitoring of disease with minimum mobility. It will also bring facilities to rural & remote areas where good doctors do not normally visit. It will reduce the load on doctors and ease the pressure on the already overused medical system.

## 5. REFERENCES


[1] Jian-xun Che, Shih-Li Su, Che-Ha Chang, "Diabetes care decision support system", Dept. of Inf. Manage., Chang Jung Christian Univ., Tainan, Taiwan

[2] Fioravanti, A., Fico, G., Arredondo, M.T.; Leuteritz, J. , "A mobile feedback system for integrated E-health platforms to improve self-care and compliance of diabetes mellitus patients," Engineering in Medicine and Biology Society, EMBC, 2011 Annual International Conference of the IEEE , vol., no., pp.3550-3553, Aug. 30 2011-Sept. 3 2011 doi: 10.1109/IEMBS.2011.6090591

[3] Jae-Hyoung Cho, Yoon-Hee Choi, Mi-Ja Kang, Hun-Sung Kim, Jeong-Ah Shin, Jin-Hee Lee, Kun-Ho Yoon, "Urgent Need of Ubiquitous Healthcare for Chronic Disease Management: Focused on Diabetes for the First Step," Applications and the Internet (SAINT), 2010 10th IEEE/IPSJ International Symposium on , vol., no., pp.379-382, 19-23 July 2010 doi: 10.1109/SAINT.2010.67

[4] Octavian Postolache, Instituto de Telecomunicações Instituto Politécnico de Setúbal, Lisbon, Portugal; Pedro S. Girão*, Mário Ribeiro, Marco Guerra, João Pincho, Instituto de Telecomunicações/IST*, Lisbon, Portugal;Fernando Santiago, António Pena, PT Inovação Aveiro, Portugal;" Enabling telecare assessment with pervasive sensing and Android OS smartphone"

[5] Claudio De Capua, *Member, IEEE*, Antonella Meduri, and Rosario Morello, *Student Member, IEEE,* "A Smart ECG Measurement System Based on Web-Service-Oriented Architecture for Telemedicine Applications," IEEE Transactions On Instrumentation And Measurement Vol.59, No.10, October 2010

[6] Roxana Suarez and Carlos Casillas, RTAC Americas Guadalajara, Mexico, "Implementing a Glucometer and Blood Pressure Monitor Medical Devices," Freescale Semiconductor, Application Note, Document Number: AN4025, Rev. 0, 3/2010

[7] Kazuaki Yamauchi, Wenxi Chen, and Daming Wei The University of Aizu Fukushima 965-8580, Japan, "3G Mobile Phone Applications in Telemedicine - A Survey," Proceedings of the 2005 The Fifth International Conference on Computer and Information Technology (CIT'05)

[8] Robert S. K Istepanian, Department of Electrical & Computer Engineering Ryerson Polytechnic University, 350 Victoria Street Toronto, Ontario, M5B 2K3, Canada; Sathish Chandran, Ericsson, Wisma Ericsson, Jalan *SS* 7/19, Kelana Jaya, 47301 Petaling Jaya, Selangor D. E., Malaysia "Enhanced Telemedicine Applications with Next Generation Telecommunication Systems", Proceedings of The First Joint EMES/EMBS Conference Serving Humanity, Advancing Technology *Oct 13-16, '99* 1516, w, Atlanta. GA, USA

[9] Timo Laakko, Juha Leppänen, Jaakko Lähteenmäki, and Antti Nummiaho *VTT Technical Research Centre of Finland, Espoo, Finland.*. "Multipurpose mobile platform for telemedicine applications"

[10] Jing Bai, Bingyi Hu, Yonghong Zhang, and Datian Ye;" A Communication Server for Telemedicine Applications", IEEE Transactions on Information Technology in Biomedicine, Vol. 1, No. 3, September 1997.

[11] Frank Ableson, Robi Sen, Chris King – "Android in Action" 2nd Edition – 2011


* * *


*Electrical and Electronics Engineering Department*
*Vel Tech University, Chennai, India*
*ranjani.rajamahendran@gmail.com*